

STEPHON H ALEXANDER
Curriculum Vitae

Department of Physics and Astronomy
The Koshland Center for Integrated Natural Sciences
Haverford College
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Citizenship: U.S

Languages: English, Spanish

Education:

2000	Brown University	Ph.D. Physics <i>Thesis Advisor: Professor Robert Brandenberger</i> <i>Thesis: "Topics at the Interface of String Theory and Cosmology"</i>
1996	Brown University	Sc.M Electrical Engineering
1995	Brown University	Sc.M Physics
1993	Haverford College	B.S Physics <i>Senior Thesis: "On Barkhausen Noise and Magnetic Hysteresis"</i>

Fellowships and Awards:

2007	NSF CAREER Award, Cosmology, High Energy Theory
2007	Foundational Questions in Physics and Cosmology Grant
2006	Columbia University Teacher's College, Community Leadership Award
2005-present	National Geographic Society Emerging Explorer Membership
2002	Issac Newton Institute for Mathematical Sciences Junior Fellow, Cambridge University
2000-2002	PPARC Postdoctoral Fellow
1998-2000	GANN Fellow
1997-98	NASA Space Grant Fellow
1994-present	New England Board of Higher Ed. Scholar
1991	Hansiker award in Mathematics
1989-93	Ira D.E.A Reid College Scholarship

Research Interests:

Theoretical cosmology at the interface with particle physics, string theory and quantum gravity

Including:

Baryogenesis, CMB Physics, Dark Energy/Cosmological Constant Problem,

Topological Defects/Solitons, Non-Perturbative QFT, Physics Beyond the Standard Model, Dark Matter

Professional Appointments:

Nov 2008	Moore Visiting Professor The California Institute of Technology, CA
Present	Associate Professor of Physics Haverford College, PA
Present	Adjunct Professor of Physics Penn State University, PA
2005-2008	Assistant Professor of Physics Penn State University, PA

Postdoctoral Research Experience:

Present	Theory Postdoctoral Researcher, SLAC and Institute for Theoretical Physics Stanford University, CA
2000-2002	Theory Postdoctoral Researcher, Imperial College, London, U.K
2001-2002	Visiting Postdoctoral Researcher, ISCAP Institute, Columbia University, N.Y
2000-2005	Visiting Postdoctoral Researcher, Perimeter Institute, Waterloo, Canada

General Research Experience:

Spring 1996	Research in Quantum Heterostructures, Electrical Engineering, Brown University, RI
1994-95	Research in Protein Structure Determination, X-ray Crystallography, Biophysics Dept., Harvard University, MA
1993-94	Science Education Research, University of Pennsylvania, PA
Summer 1994	Physics Education Research, City on A Hill Charter School, MA
Summer 1993	Computer Engineering Research, Carnegie Mellon University, PA

Professional Appointments:

Present	Board of Directors Network for the Improvement of World Health
Present	Emerging Explorer The National Geographic Society
Present	Scientific Member Institute for Gravitation and the Cosmos
Present	Member National Society of Black Physicists

Teaching Experience:

Fall- Spring 2007-8	Taught sophomore level, Modern Physics and Intro Quantum, Penn State
Spring 2007	Developed and taught graduate level course on the Standard Model of Particle Physics, Penn State
Spring 2006	Developed and taught graduate level course in cosmological perturbation theory and the CMB, Penn State
June 2004	Taught Cosmology Course, COSM Summer School, JLAB, U.S.
July 2003-5	Group Mentor, Young Physicists of Canada, YPC, Perimeter Institute, Canada
June 2003	Physics Teacher, GAMS Summer School, NASA/UMD
2000-2002	Teaching Postdoctoral Fellow, Imperial College
1997-2000	Math and Physics Volunteer Teacher, Providence Public Schools
Summer 1996	Taught Freshman Physics, Brown Summer Session, Brown
Summer 1995	Science Teacher, Brown Summer School, Brown
Summer 1994	Summer High School Physics Teacher, City on a Hill Charter School

Outreach Activities:

Nov 2008	Keynote Address, National Science Teachers Conference, Dallas, TX
August 2008	Presentation, Google Complex
June 2008	Keynote Address, National Oceanic and Atmospheric Administration
June 2008	Featured Video Interview, www.Bigthink.com
Nov 2007	Public Lecture, Research Unplugged, Downtown Theatre, State College, PA
Nov 2007	Discover Magazine Article on Dark Energy co-authored with Jaron Lanier
Sept 2007	Keynote Speaker: National Institute for Teaching and Mentoring
June 2007	NOVA Science Now, Interview on the physics of the LHC
June 2007	Entertaining Science Presentation, The Cornelia St. Cafe, NYC, N.Y
June 2006	The Ensemble Studio Theatre, Cabaret Scientifique, Lecture and Performance
May 2006	National Geographic Society, Explorer Symposium Presentation, Wash D.C.
February 2006	Columbia University Teachers College, Keynote Speaker
2006-Present	National Geographic Emerging Explorer
October 2005	Appearance on NOVA Feature $E = mc^2$
2004-2005	World Year of Physics, Quantum Diaries Web Blogger
Fall 2005	Imagine Magazine for Talented Youth
Winter 2005	World Wide web cast at the Exploratorium
Winter 2004	Music and Physics Lecture and Performance, Duke University Music and Physics
Winter 2003	Performed at Roald Hoffman's Entertaining Science in N.Y.

Invited Seminars and Conference Talks:

March 2009	Plenary Speaker National Academy of Sciences Frontiers of Science Symposium India
Nov 2008	The Cosmological Constant: Change we Can Believe in Cal Tech
March 2008	“The Origin of Galactic Magnetic Fields from String Theory” University of Pennsylvania
February 2008	“Overview of Cosmology” The Annual Meeting of National Society of Black Physicists
October 2007	Theory Seminar, University of Pennsylvania “The Baryon Asymmetry, Inflation and String Theory”
October 2007	Colloquium, Haverford College “Dark Energy: The Mr Hyde of Cosmic Inflation”
August 2007	Theory Seminar, Mc Gill University, Canada “Emergent Inflation.”
June 2007	Joint Theory Seminar, Carnegie Mellon University, University of Pittsburgh “Can we Detect the Baryon Asymmetry with Gravity Waves in the CMB?”
May 2007	Public Lecture: National Geographic Society Headquarters, Wash. D.C. “The Dark Mysteries of the Universe”
Sept 2006	Colloquium, Colgate University “Dark Energy: The Cosmological Constant in Disguise”
Aug 2006	Seminar, University of Amsterdam “Quantum Gravity and the Cosmological Constant”
Aug 2006	Seminar, University of Utrecht “Quantum Gravity and the Cosmological Constant
Aug 2006	Invited Seminar, UC Berkeley Astrophysics “The WMAP Anomaly meets the Anomaly”
March 2006	Invited Seminar, ISCAP, Columbia University “The WMAP Alignment Anomaly and Parity Violation in the CMB”
Feb 2006	Invited Seminar, National Society of Black and Hispanic Physicists “The Anomalies in the WMAP3 data”
Jan 2006	Invited Lecture, McGill University, Canada “The Dark Energy Problem”
July 2005	Public Lecture, U. West Indies, Trinidad, W.I. “Beyond Einstein: The Dark Energy Problem ”
May 2005	Plenary Talk, U. British Columbia

April 2005	<p>“A Quantum Gravitational Relaxation of the Cosmological Constant” American Physical Society Spring Meeting</p>
March 2005	<p>“Inflationary Gravity Waves and the Matter-Anti Matter Problem” Invited Seminar, Harvard University</p>
February 2005	<p>“Baryogenesis and String Theory” MIT</p>
February 2005	<p>“An Observational Constraint on the Fundamental String Scale” Departmental Colloquium, Duke University</p>
December 2004	<p>“Beyond Inflationary Cosmology” California Institute of Technology</p>
October 2004	<p>“A Signal of Cosmological Birefringence in the CMB” Public Lecture, Duke University</p>
October 2004	<p>“The Real Matrix: An Overview of the New Cosmology” Duke University</p>
October 2004	<p>“Seeing The String: The Cosmic Baryon Asymmetry and a String Realization” University of Michigan</p>
July 2004	<p>“Inflationary Baryogenesis and String Cosmology” Jefferson Lab, Hampton Virginia</p>
May 2004	<p>“The New Cosmology and the Dark Energy Problem” Perimeter Institute, Canada</p>
May 2004	<p>“Matter-Antimatter Asymmetry from Inflationary Gravity Waves” New York University, N.Y., N.Y.</p>
Feb 2004	<p>“Leptogenesis from Gravity Waves in Models of Inflation” UC Berkeley, Berkeley CA</p>
Dec 2003	<p>“Matter-Antimatter Asymmetry from Inflationary Gravity Waves” Harvard University, Cambridge, MA</p>
Dec 2003	<p>“A Unified Baryogenesis Mechanism from Primordial Gravity Waves” Columbia University, N.Y, N.Y</p>
Nov 2003	<p>“A Unified Baryogenesis Mechanism from Primordial Gravity Waves” KITP, UCSB, CA</p>
Nov 2003	<p>“An Overview of D-brane Inflation in String Theory” UC Davis, Davis, CA</p>
May 2003	<p>“Inflation and Quantum Gravity” Cal Tech, Observational Cosmology Group, Pasadena, CA</p>
May 2003	<p>“Inflation and String/M-theory” UCLA , Los Angeles, CA</p>
	<p>“Brane Gas Cosmology and M-theory ”</p>

February 2003	National Society of Black Physicists, Atlanta, GA “Inflation Meets Quantum Gravity”
March 2003	Perimeter Institute, Canada “Brane Gases in The Early Universe”
June 2002	McGill University, Montreal, Canada “Topological Inflation and String Theory”
May 2002	University of Geneva, Geneva, Switzerland “Why are Three Dimensions Large in Our Universe?”
February 2002	Perimeter Institute for Theoretical Physics, Canada “Inflation and String Theory”
September 2001	Institute for Advanced Studies, Princeton, NJ Informal: “A Survey of Transplankian Physics and Inflation”
September 2001	NYU, New York, NY “The Brane Gas Cosmological Scenario”
September 2001	Brown University, Providence, RI “On Tachyon Condensation and Inflation”
August 2001	M-Theory Cosmology, Cambridge University, Cambridge, U.K “The Noncommutative Inflationary Scenario”
July 2001	Corfu Summer Institute, Corfu, Greece “Inflation From D-Brane Annihilation”
June 2001	Columbia University, N.Y. “Emission of Positive Cosmological Constant in the R-S Brane World”
July 2001	NASA Goddard Astrophysics Lab Colloquium “The Interface of M-theory and Cosmology”
April 2001	Public Lecture in London, London, U.K “Superstrings and the Big Bang”
March 2001	Cambridge University, U.K “Inflation from String Theory”
December 2000	Imperial College, U.K “Brane Gases in the Early Universe ”
March 2000	University of British Columbia, Vancouver, Canada “The Varying Speed of Light Scenario from String/M Theory”
January 2000	Aspen Center for Physics, Aspen, CO “VSL from a D-brane Universe”
August 1999	Summerbridge School, Providence, RI “What is a Topological Defect?”

July 1999	TASI '99 "Strings, Branes and Gravity", Boulder, CO "The Attraction-Annihilation Mechanism in Hybrid Topological Defects"
May 1999	University of The West Indies, Kingston, Jamaica "Common Issues in String Theory and Cosmology"
February 1999	University of British Columbia, Vancouver, Canada "The Interaction of Monopoles and Domain Walls"
November 1998	Brown University, Providence, RI "The Creation of a Universe From an Instanton"
July 1998	Brazilian School of Gravity and Cosmology, Rio de Janeiro, Brazil "The Interaction of Topological Defects"

Conferences, Workshops, and Schools:

Summer 2007	FQXi Annual Conference, Reykjavik, Iceland
Spring 2007	National Geographic Explorer Symposium, Wash. D.C
Summer 2007	Foundations of Cosmology International Conference, Iceland
Winter 2005	McGill String Cosmology Workshop
Summer 2004	SLAC Summer Institute
Fall 2003	Superstring Cosmology KITP, UCSB, Santa Barbara, CA
Summer 2003	Frontiers of Mathematical Physics PIMS, UBC, Vancouver, Canada
Summer 2002	Frontiers of String Theory and Cosmology Aspen Center for Physics, Aspen CO, U.S
Spring 2002	ICTP String Theory Workshop International Center for Theoretical Physics, Trieste, Italy
Summer 2001	M-Theory Cosmology, Cambridge University, Cambridge, U.K
Summer 2001	DESY Gravity and Particle Physics Workshop Hamburg, Germany
Summer 2001	Corfu Summer Institute on Particle Physics and Cosmology Corfu, Greece
Winter 2001	M-Theory Workshop Ecole Normale Supérieure, Paris, France
Winter 2000	Cosmology at the Millennium Aspen Center for Physics, Aspen CO
Winter 2000	RTN Network "The Quantum Structure of Spacetime" Humboldt University, Berlin, Germany
Fall 2000	Quantum Gravity Workshop, NBI, Copenhagen, Denmark
Summer 1999	TASI 99 "Strings, Branes and Gravity"

	Boulder, CO
Summer 1998	Brazilian School of Gravity and Cosmology Rio de Janeiro, Brazil
Summer 1997	Annual Meeting of National Society of Black Physicists, LBL Laboratories, Berkeley, CA
Spring 1997	National Society of Black Engineers Nashville, TN
Spring 1996	From Quantum Fluctuations to Large Scale Structure: School in Astrophysics and Cosmology Casablanca, Morocco
Winter 1995	Compact For Faculty Diversity Fellows National Conference University of Arizona, Tuscon AZ

Publications and Papers:

- [1] The Cosmological BCS Mechanism and the Big Bang Singularity
with Tirthabir Biswas
arXiv:0807.4468
- [2] Quantum Gravity as a Fermi Liquid
with Gianluca Calcagni
Foundations in Physics 2008, arXiv:0807.0225
- [3] Superconducting Loop Quantum Gravity and the Cosmological Constant
with Gianluca Calcagni
- [4] Chern-Simons Modified Gravity as a Torsion Theory and its Interaction with Fermions
with Nico Yunes
Phys. Rev D77: 124040, 2008
- [5] A Gravitational-wave Probe of Effective Quantum Gravity
with Lee Samuel Finn and Nico Yunes
Accepted in Phys. Rev D, 2008
- [6] Local Void vs Dark Energy: Confrontation with WMAP and Type Ia Supernovae.
with Tirthabir Biswas, Alessio Notari and Deepak Vaid
astro-ph/0712.0370
- [7] On the Transfer of Adiabatic Fluctuations through a Nonsingular Cosmological Bounce.
with Tirthabir Biswas and Robert Brandenberger
hep-th/0707.4679
- [8] Parametrized Post-Newtonian Expansion of Chern-Simons Gravity.
with Nico Yunes.
hep-th/0704.0299, Accepted to Phys. Rev D (2007)

- [9] A New PPN parameter to test Chern-Simons Gravity.
with Nico Yunes.
hep-th/0703265, Accepted to Phys. Rev Lett.
- [10] Reheating, Dark Matter and Baryon Asymmetry: A Triple Coincidence in Inflationary Models.
with Peter Meszaros
hep-th/0703070
- [11] The Hubble Web: The Dark Matter Problem and Cosmic Strings.
hep-th/0702212
- [12] Gravity Induced Chiral Condensate Formation and the Cosmological Constant.
hep-th/0609066
- [13] Is Cosmic Parity Violation Responsible for the Anomalies in the WMAP Data?
hep-th/0601034, accepted to Phys. Lett B
- [14] A Quantum Gravitational Relaxation of the Cosmological Constant.
hep-th/0503146, Phys.Lett.B629:53-59,2005.
- [15] Fermionic Sectors for the Kodama State
with Kristin Schleich and Donald Witt
SLAC-PUB 10841
- [16] Birefringent Gravitational Waves and the Consistency Check of Inflation
with Jerome Martin
Phys. Rev. D71:063526, 2005
- [17] Can The String Scale be Related to the Cosmic Baryon Asymmetry?
with Jim Gates
hep-th/0409014, JCAP 0606:018,2006.
- [18] In the Realm of the Geometric Transitions
with K. Becker, M. Becker, K. Dasgupta, A. Knauf, R. Tatar
Nucl. Phys. B704:231-278,2005
- [19] The Gravitational Instability of the Vacuum: Insight Into the Cosmological Constant Problem
hep-th/0406202
- [20] Leptogenesis From Gravity Waves in Models of Inflation
with Michael Peskin and M.M Sheikh-Jabbari
hep-th/0403069, Phys.Rev.Lett.96:081301,2006.
- [21] Quantum Gravity and Inflation
with Justin Malecki and Lee Smolin
Phys. Rev. D70:044025, 2004
- [22] The Geometrization of Matter Proposal in the Barrett-Crane Model
and Resolution of Cosmological Problems.
with Marni Sheppard and Louis Crane

gr-qc/0306079

- [23] Nontopological Inflation from Embedded Defects
with Robert Brandenberger and Moshe Rozali
hep-th/0302160
- [24] Brane Gas Cosmology, M Theory and Little String Theory
JHEP 0310:013,2003, hep-th/0212151
- [25] Quintessence and Variation of the Fine Structure Constant in the CMB
with Greg Huey and Levon Pogosian
Phys. Rev. D65:083001,2002
- [26] Noncommutative Inflation
with Robert Brandenberger and Joao Magueijo
Phys. Rev. D67:081301, 2003
- [27] A Thermal Instability for Positive Brane Cosmological Constant in the Randall Sundrum Cosmologies
with Yi Ling and Lee Smolin
Phys. Rev. D65:083503,2002
- [28] Inflation from D-Anti -D-Brane Annihilation
Phys. Rev. D65:023507, 2002
- [29] Noncommutative Geometry as a Realization of Varying Speed of Light Cosmology
with Joao Magueijo
hep-th/010403
- [30] Attractive Forces Between Global Monopoles and Domain Walls
with Robert Brandenberger and Richard Easther
hep-ph/0008014
- [31] Brane Gases in the Early Universe
with Robert Brandenberger and Damien Easson
Phys. Rev. D62:103509,2000
- [32] On the Varying Speed of Light in a Brane Induced FRW Universe
JHEP 0011:017,2000
- [33] On the Interaction of Monopoles and Domain Walls
with Robert Brandenberger, Richard Easther and Andrew Sornborger
hep-ph/9903254